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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/516,998

08/16/2005

Thierry Leon Lagarde

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EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

01/02/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/516,998

Applicant(s)

LAGARDE ET AL.

Examiner

Rakesh K. Dhingra

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 December 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>04/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 04/08/2005 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered. In this explanation of relevance in English has not been supplied for the French documents 1) EP 1075168, and 2) 2702119.

Drawings

Figures 1, 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter

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sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 4, 6, 7, 9 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al (US Patent No. 6,165,274) in view of Wu (US Patent No. 6,114,811).

Regarding Claim 1: Akiyama et al teach a plasma apparatus comprising:

a coaxial applicator of microwave energy whose one end is connected to a microwave source and the other end is directed to the gas being excited;

the applicator is arranged in a wall 1001 of the chamber;

the applicator comprising a central core 1004 that penetrates the wall 1001 of the chamber and an outer core 1005 with a dielectric material 1002 (alumina/boron nitride) being completely filled in the space between the central core 1004 and the outer core 1005, such that said dielectric material is substantially flush with the level of the wall of the chamber (for example, Fig. 2 and col. 6, line 45 to col. 7, line 6).

Akiyama et al do not explicitly teach the central core 1004 being substantially flush with the wall of the chamber, but teach that central core and the cathode can be separate parts that are joined together.

Wu teach a plasma apparatus comprising a processing chamber 6 with a transmission wall 7 through which coaxial feed-throughs 14 are disposed for transmitting microwave energy into the chamber 6. Wu teach that the length of central core 10 is flush with the thickness of the wall 7 (towards the chamber 4). Wu also teach that length of the central core 10 is related to the amount of microwave energy to be coupled through the central core and is optimized (as a result effective variable) for controlling the energy being coupled through the central core (for example, Fig. 1, 9 and col. 4, line 33 to col. 5, line 8). It would be obvious to optimize the length of the central core in the apparatus of Akiyama et al in view of teaching of Wu to control the coupling of microwave in the processing chamber.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to optimize the length of the central core as taught by Wu in the apparatus of Akiyama et al to control the coupling of microwave in the processing chamber.

Regarding Claim 2: Akiyama et al teach the dielectric material is alumina or boron nitride (refractory ceramics) [col. 13, lines 15-25].

Regarding Claim 4: Akiyama et al teach the dielectric material 1002, 1012, 1008 fills the entire space coaxial space to prevent abnormal discharging at the central core 1004 and at the inner face of the outer conductor 1005 (for example, Fig. 8 and col. 8, lines 1-10 and col. 9, lines 44-67).

Regarding Claims 6, 7: Akiyama et al teach sealing members 1009 inserted between the dielectric 1002, the central core 1004 of the applicator and the internal wall of the outer conductor 1005 of the applicator {Fig. 2 and col. 7, lines 1-6}. Further it would be obvious to embed the o-rings 1009 in the internal and external walls of the outer tube 1005 instead of placing these completely in the dielectric, depending upon the degree of vacuum required in the chamber and the ease of making a groove for the seal in the internal and external walls of the chamber.

Regarding Claim 9: Wu teaches a dielectric plate 9 that extends to the interior of the chamber 6 on the interior wall thereof and completely covers the plasma excitation devices 10, 12 (Fig. 1 and col.4, lines 35-55).

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Regarding Claim 11: Applicant has invoked 35 USC 112, 6th Paragraph regarding claim limitation "means for cooling the applicators in the central core of each applicator", for which the structure disclosed by the applicant comprises a water circulation circuit (page 7, lines 27-29).

Akiyama et al teach coolant (water) inlets 1006 and exhaust 1007 to cool the central core 1004 and the cathode electrode 203 (for example, Fig. 2 and col. 7, lines 1-6).

Regarding Claim 12: Claim limitation pertaining to pressure of plasma between a value of about 1 millitorr and about a few tens of torr is a functional limitation and since the apparatus of prior art meets all the structural limitations, the apparatus is considered capable of meeting the functional limitations.

In this connection courts have ruled:

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959).

Apparatus claims cover what a device is, not what a device does *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15USPQ2d 1525, 1528 (Fed. Cir. 1990)

Regarding Claim 13: Wu teaches the apparatus can have a plurality of applicators (through-openings 14) and arranged in a two dimensional network in the wall 11 of the chamber. Wu further teaches that the number of applicators can be adjusted as per requirement of homogeneity of transmission of microwave energy. Further, it would be obvious to optimize the number of applicators as per process limitations like substrate size and microwave power requirement in the processing chamber 6 (Fig. 1, 2 and col. 5, lines 50-60).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al (US Patent No. 6,165,274) in view of Wu (US Patent No. 6,114,811) as applied to claims 1, 2, 4, 6, 7, 9 and 11-13 and further in view of Jewett (US Patent No. 6,156,667).

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Regarding Claim 3: Akiyama et al in view of Wu teach all limitations of the claim except that the dielectric material is an alloy of silica and/or of aluminum nitride and/or of alumina.

Jewett teach a plasma apparatus comprising of a process chamber 10 where a dielectric material 15 faces the plasma generating space and the dielectric material then transfers heat to a cooling instrument 25 through a heat moderating material 20. Jewett further teach that the dielectric material comprises of ceramic composites like a mixture of silica and aluminum nitride or mixture of silica and alumina, which are known suitable dielectric materials for use in plasma processing apparatus (for example, Fig. 1 and col. 9, lines 40-50).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to use a dielectric material that is an alloy of silica and/or of aluminum nitride and/or of alumina as taught by Jewett in the apparatus of Akiyama et al in view of Wu as a known suitable dielectric material for use in plasma processing apparatus to obtain desired heat transfer properties besides transparency to electromagnetic radiation.

In this connection courts have ruled:

The selection of a known material based on its suitability for its intended use is prima facie obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al (US Patent No. 6,165,274) in view of Wu (US Patent No. 6,114,811) as applied to claims 1, 2, 4, 6, 7, 9 and 11-13 and further in view of Takaki et al (US Patent No. 6,279,504).

Regarding Claim 5: Akiyama et al in view of Wu teach all limitations of the claim except that the length of the dielectric material is equal to $\frac{1}{2}$ times wavelength of the microwaves in the dielectric material.

Takaki et al teach a plasma apparatus comprising of a coaxial waveguide like structure in which central core 3 is surrounded by a dielectric member 4. Takaki et al further teach that length of the central

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core 3(that is, the length of the dielectric material 4) is $\frac{1}{2}$ times wavelength of the microwaves in the dielectric material (for example, Fig. 3A, 3B and col. 5, line 50 to col 6, line 30).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to use a length of the dielectric material as $\frac{1}{2}$ times wavelength of the microwaves in the dielectric material, as taught by Takaki et al in the apparatus of Akiyama et al in view of Wu to obtain an optimized electric field energy distribution of the standing waves.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al (US Patent No. 6,165,274) in view of Wu (US Patent No. 6,114,811) as applied to claims 1, 2, 4, 6, 7, 9 and 11-13 and further in view of Yoshida (US Patent No. 5,234,565).

Regarding Claim 8: Akiyama et al in view of Wu teach all limitations of the claim except central core terminates in a permanent magnet encapsulated in the central core and flush with the walls of the chamber. However use of permanent magnet in the central core of coaxial applicator is known in the art to facilitate plasma ignition at low pressure as per reference cited hereunder.

Yoshida et al teach a plasma apparatus comprising a coaxial plasma source with a central core 14a having a permanent magnet 17 at the end of the central core and where the magnet 17 is flush with the wall of a chamber 21. Yoshida further teach that by the use of permanent magnets in the central core a uniform and high density plasma can be generated even at low pressure (for example, Fig. 2 and col. 5, line 50 to col. 7, line 45).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to use a permanent magnet in the central core as taught by Yoshida in the apparatus of Akiyama et al in view of Wu to enable start high density plasma at low pressure.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al (US Patent No. 6,165,274) in view of Wu (US Patent No. 6,114,811) as applied to claims 1, 2, 4, 6, 7, 9 and 11-13 and further in view of Kumihashi et al (US Patent No. 5,368,685).

Regarding Claim 10: Akiyama et al in view of Wu teach all limitations of the claim including plurality of applicators in the chamber wall 9 but do not teach means for cooling each applicator in the chamber walls.

Applicant has invoked 35 USC 112, 6th Paragraph regarding claim limitation “means for cooling each applicator in the chamber wall” for which the structure disclosed by the applicant comprises cooling of portions of chamber wall 3 between applicators by water circulation through pipes 13 (page 7, lines 27-29). {claim limitation “for cooling each applicator in the chamber wall” is interpreted to mean that by cooling the chamber wall spaces, the applicators 4 will also get cooled – in terms of disclosure at page 7, lines 27-29 and page 10, line 10-13}.

Kumihashi et al teach a plasma apparatus comprising a plasma applicator including microwave generator 1, waveguide 3 and a chamber 10 whose walls are cooled by a cooling mechanism 2 that flows a coolant through coolant passages (for example, Fig. 1 and col. 6, lines 1-5 and col. 9, lines 1-20). Though Kumihashi et al do not teach plurality of applicators, it would be obvious to provide such cooling circuit through-out the wall of chamber to enable cool all the applicators in the wall of the chamber. Further, though Kumihashi et al do not explicitly teach that the coolant is water, it is known in the art to use water as a coolant in plasma processing apparatus.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide means for cooling each applicator in the chamber wall as taught by Kumihashi et al in the apparatus of Akiyama et al in view of Wu to obtain high density plasma with high selectivity ratio.

In this connection courts have ruled:

The selection of a known material based on its suitability for its intended use is prima facie obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rakesh K. Dhingra



Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1792